CHAPTER 5

ORAL PATHOLOGY

Oral pathology is the science that treats the nature, causes, and development of oral diseases. It includes both the clinical and the microscopic study of structural and functional changes that cause, or are caused by, oral and other diseases. Either the calcified or the soft tissues of the oral cavity, or both, may be involved.

Some of the abnormal conditions that exist in the oral cavity and cause patients to request treatment will be described in this chapter and chapter 6, "Treatment of Oral Diseases." Occasionally, the Dental Technician might be the first one to observe these pathologic conditions in the patient's mouth. Always notify a dental officer if you observe a condition you may have in question. Never make a diagnosis or tell a patient what you think he/she might have. That area of expertise is the sole responsibility of the dental officer.

Although there are many oral anomalies (deviations from normal), this chapter is limited to the two classes of prime interest to Dental Technicians. These classes are discussed in the following statements:

- Congenital anomalies—Occur before birth. Examples of such are cleft palate, cleft lip (fig. 5-1), and supernumerary teeth.
- Acquired anomalies—Occur after birth. Examples are periodontal disease and dental caries.
- Pathogenic conditions of the oral cavity may be caused by:

  —Pathologic micro-organisms: Destroy the calcified tissues and inflame the soft tissues in the oral cavity.

  —Defective development: Involves the calcified tissues as a result of infection, trauma, nutritional deficiencies, disease, or heredity.

  —Degeneration: Involves the hard or soft tissues.

  —Malocclusion: Results from defective development of the jaws or loss of teeth, and produces excessive stress on portions of the periodontium.

  —Trauma: Involves either the calcified or soft tissues.

Figure 5-1.—Cleft lip of an infant.

—Neglect: Result of the lack of proper oral hygiene.

MICRO-ORGANISMS

Salivary glands secrete about 1,500 ml of saliva on a daily basis. Microscopic counts in saliva show an average of 750 million micro-organisms per milliliter. Because the temperature in the oral cavity is around 98.6° Fahrenheit, the mouth is the perfect environment for micro-organisms to live. Micro-organisms have a dark, moist, warm area, and a good source of food supply to live. These micro-organisms can be divided into four major classifications-bacteria, protozoa, viruses, and fungi—which will be discussed in chapter 9, "Infection Control."

ORAL LESIONS

Oral lesions can be defined as any pathological or traumatic disorder of tissue that creates a loss of function of the area affected. They can include wounds, sores, and any other tissue damage resulting from disease or injury. Many types of lesions can occur in the mouth. The location of the lesion can assist in determining the type.

LESIONS BELOW THE SURFACE

The types of lesions that extend below the surface of the mucosa and are the most common in oral pathology are the following:

- **Abscess**—A localized collection of pus in a specific area of soft tissue or bone. Often it is confined in a particular space, and is commonly caused by a bacterial infection.
- **Cyst**—An enclosed pouch or sac that contains fluid or semisolid material.
- **Ulcers**—A disruption of the superficial covering of the mucosa or skin. May be caused by biting, denture irritation, toothbrush injury, viruses or other irritants.

ELEVATED LESIONS

Numerous types of lesions are above the surface of the mucosa. Two of the most common are discussed below.

- **Vesicles**—A small elevation that contains fluid. Most of these lesions in the oral cavity rupture, leaving superficial ulcers.
- **Hematoma**—A localized collection of blood that escaped from blood vessels due to trauma. It is well-defined and with time, changes to a dark color.

NONELEVATED LESIONS

Two common lesions of the oral mucosa in this category are as follows:

- **Petechiae**—Round pinpoint, nonraised, purplish-red spots, caused by mucosal or dermal hemorrhage.
- **Ecchymoses**—Large, purplish-red areas caused by blood under the skin or mucosa; turns to a blue or yellow color.

DISEASES OF THE TEETH

Teeth become diseased for many reasons. We will look at some of the more common diseases found in teeth such as impaction, attrition, abrasion, erosion, resorption, and dental caries.

IMPACTION

An *impaction* (fig. 5-2) is the condition in which a tooth is blocked by a physical barrier, usually teeth or bone. A tooth may not erupt in the normal time period if an impaction occurs. Some of the causes of impacted teeth are:

- Movement of the erupting tooth into a horizontal, vertical, or other abnormal position.
- Early loss of deciduous teeth.
- Insufficient jaw space, abnormally large tooth crowns, supernumerary or other teeth in a dental arch.

ABRASION AND ATTRITION

Attrition (fig. 5-3) is the loss of substance of a tooth from a wearing away process caused by teeth against teeth. Whereas, *abrasion* results in the loss of tooth structure secondary to the action of external agents.

In attrition, wear involves aspects on the incisal, occlusal, and interproximal surfaces of the teeth and is considered a normal or gradual loss of tooth substance because of the mastication of food. Causes of occlusal attrition can result from bruxism (grinding of teeth), chewing of tobacco or gum, or other oral habits that involve mastication.

In abrasion, one or more teeth may show wear, generally brought about by improper toothbrushing,

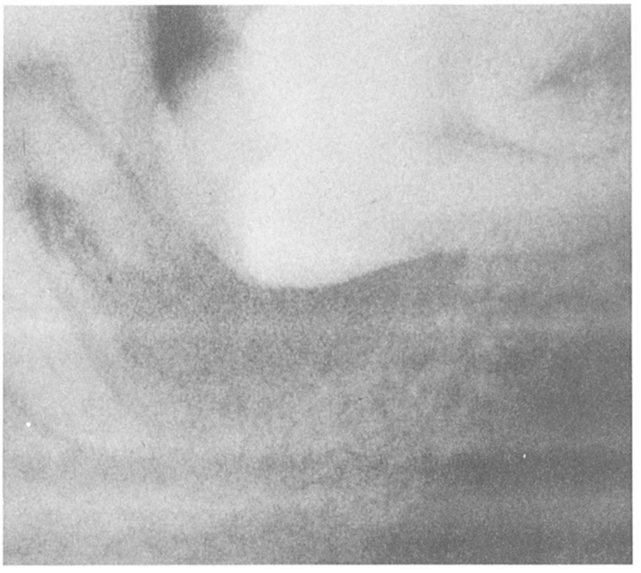

Figure 5-2.—Impaction.

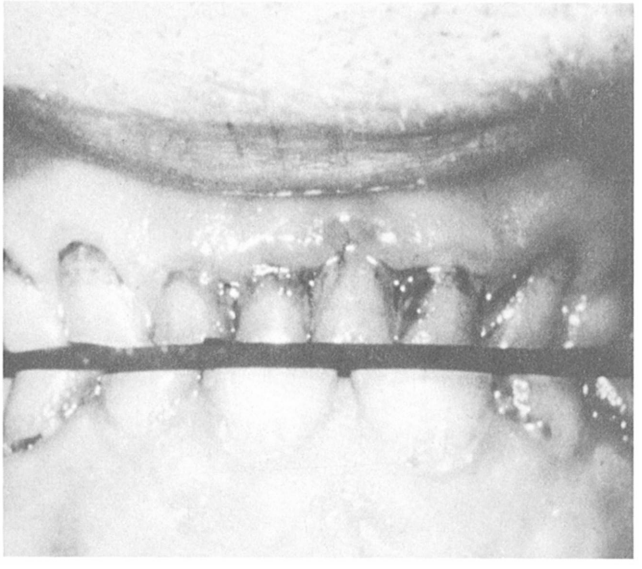

Figure 5-3.—Attrition.

biting foreign objects such as a pipestem, thread, or bobby pins. Other mechanical actions such as a poorly fitted clasp of partial dentures or acid from food debris can cause abrasion.

EROSION

Erosion is a loss of tooth substances from a chemical process that does not involve bacteria. It occurs usually on the facial surfaces at the gingival third of the crown and often involves the maxillary incisors. The enamel and dentin on the floor of the lesion are smooth, hard, and glistening. Some types of lesions are called idiopathic erosion because the factors producing this condition are unknown or may occur from a known acid source such as people who have bulimia (who vomit frequently).

During the early stages of erosion, the eroded areas are very sensitive to heat and cold, acid foods, and toothbrushing, but sensitivity may decrease when secondary dentin is formed.

DENTAL CARIES

Man has suffered the effects of dental caries for centuries, and much study and research have been devoted to their causes and prevention. The disease is caused by a microbial process that starts on the surface of the teeth and leads to the breaking down of the enamel, dentin, and cementum, in some cases causing pulp exposure. This pathologic break that is produced on or in the tooth surface is called *acarious lesion* (fig. 5-4) or commonly called a cavity. The process that destroys the hard surfaces of the tooth is called *decay.*

Contributing Factors

The cause of tooth decay has been linked to a group of bacteria called streptococci and other acid producing bacteria that are in the oral cavity. Decalcification of the enamel, the first step in the decay process, is caused by:

- Bacterial plaque adhering to the smooth surfaces of the teeth
- Acid, produced by bacteria in food debris, being trapped in pits and fissures

Decay Process

Dental caries usually appear first as a chalky white spot on the enamel, which indicates the decalcification process. If proper oral hygiene is not maintained, the lesion may become stained and take on a dark appearance. In pit and fissure caries, the area of decalcification at the surface is normally small, and the white spot is less noticeable than in smooth surface caries. In either type of caries, the surface becomes roughened, as can be noted by passing a dental explorer point over it. If the tooth surface has an area that has not progressed past the decalcification stage, this type of carious lesion is called incipient. As the decay spreads in the enamel, it may stop. If this occurs, the process is called an arrested carious lesion (fig. 5-5). These areas in which dental caries have been arrested are dark and, in some instances, hollowed out. A dental explorer passed over or in these areas will feel hard to the touch. If the area still has active decay, the explorer may “sink in” the soft decay.

Dental caries can progress further into the dentin of the tooth, and spread out laterally widely undermining the enamel and dentin. If this occurs, often there may be no visible changes until extensive destruction has taken place. The condition of the caries if not arrested or restored with operative dentistry (filling) will spread through the dentin into the pulp of the tooth, thus requiring endodontic treatment (root canal).

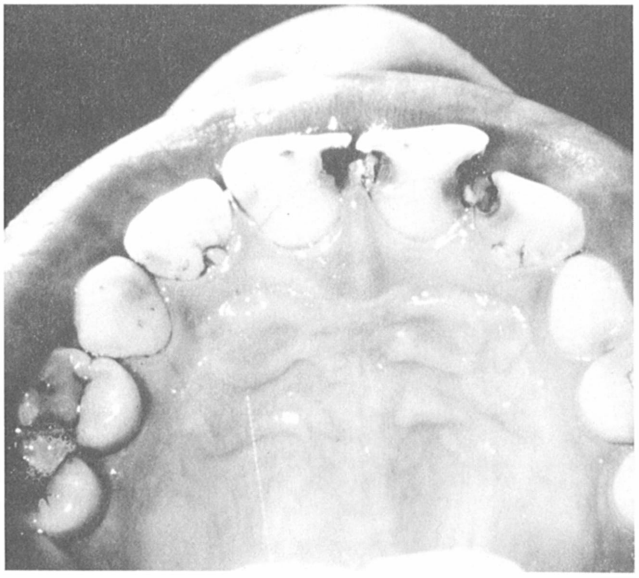

Figure 5-4.—Carious lesions.

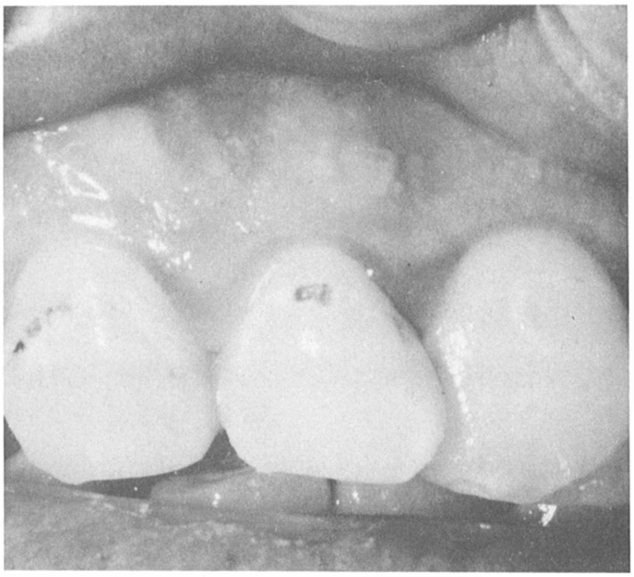

Figure 5-5.—Arrested caries.

RECURRENT CARIES

Recurrent caries are decay processes that occur underneath existing dental restorations. More simply stated, another cavity has occurred in the tooth where there was a filling or restoration. Some of the causes are as follows:

- Improper cavity preparation—The dentist was unable to remove all of the decay in the tooth before the placement of a restoration.
- Inadequate cavity restoration—Open margins (space in-between the restoration and tooth).
- Old restorations—The margins of the restoration break down or are not completely sealed when originally placed, creating a "leaky margin."

TYPES OF CARIOUS LESIONS

Depending on its location, a carious lesion is designated as either a pit and fissure type or a smooth surface type. Pit and fissure caries develop in depressions of teeth surfaces that are hard to keep clean of food debris and plaque.

Smooth surface caries usually develop on the proximal surface (fig. 5-6) or the gingival third of facial and lingual surfaces on the teeth. These areas in-between (interproximal) the teeth are where plaque accumulate and form, starting the decay process.

DISEASES OF THE DENTAL PULP

The dental pulp is a living tissue. All living tissues can die or become diseased. The dental pulp is composed of vascular connective tissue encased in dentin, which provides protection. Even with this protection, the pulp may receive injuries by thermal changes, carious lesions from micro-organisms, and mechanical trauma. The extent of pulpal damage and the vitality (life) of the tooth depend on the severity of injury and how the pulp will react to disease. The term pulposis refers to any disease involving the dental pulp. Some of the more common diseases of the pulp are pulpalgia, pulpitis, periapical abscess, and necrosis, which are briefly explained next.

PULPALGIA

Pulpalgia refers to pain in the dental pulp, and commonly occurs after a restoration has been placed in a tooth. It can also be caused by root planing and periodontal surgery. The tooth may become sensitive to touch, temperature changes, and sweet or sour foods. Pain associated with pulpalgia has been described as short, sharp shooting pain that may increase when lying down or walking upstairs.

PULPITIS

Pulpitis is an inflammation of the dental pulp, usually caused by a bacterial infection resulting from

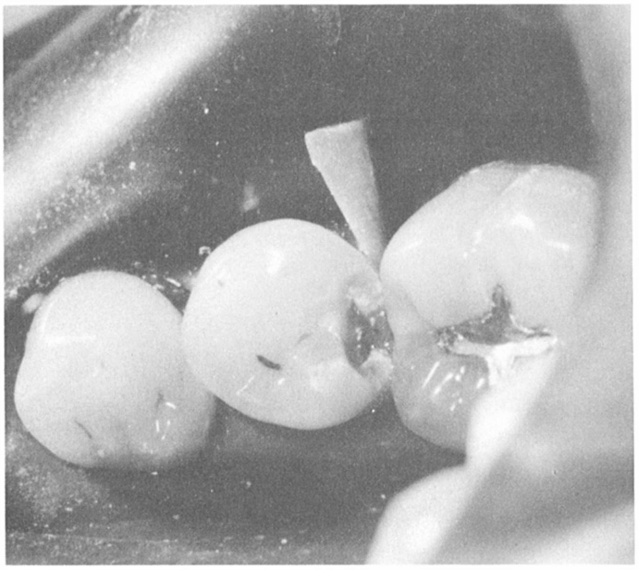

Figure 5-6.—Interproximal caries.

dental caries or fractured teeth. Pulpitis may be caused by other conditions, such as chemical irritants and thermal changes with materials used in dental restorations that can transmit heat or cold to the dental pulp. When micro-organisms enter the pulp, they start to produce severe damage, which leads to a buildup of pressure in the canal. The result of this pressure may cause a dull ache that can lead to a more severe, pulsating pain. When severe pulpitis occurs, the dentist may remove a portion or all of the pulp in an injured tooth.

PERIAPICAL ABSCESS

A *periapical abscess* results when the pulp has become inflamed and a small pus-like abscess forms in the pulpal canal. If left untreated, the inflammation spreads out through the apex of the root and into the bone. As the abscess gets bigger, pressure from the inflammation and pus at the apex of the root may cause the tooth to be pushed up higher in its socket. The patient may complain the tooth feels "high" when biting and very sensitive to touch.

Bone loss around the apex of the tooth can occur if left untreated. The abscess and bone loss at the apex cause a radiolucency appearing like a "grape" when viewed radiographically. The course that the abscess of pus follows from the apex, into the jaw bone, and drains into the mouth is referred to as a *fistula*

NECROSIS

The death of tissue is called *necrosis.* Pulpal necrosis can occur as a result of untreated pulpitis or from a traumatic injury. A tooth that is necrotic must be treated. The dead pulpal tissue will decompose, producing toxins that will smell foul or rotten when the tooth is being treated. Dental pain may or may not occur from a necrosis.

PATHOLOGY OF THE PERIODONTIUM

Periodontal disease is the most prevalent chronic disease of mankind. The term *periodontal disease* refers to all diseases of the periodontium and can affect the tissues around and supporting the teeth. As a basic dental assistant, you should know symptoms of periodontal disease your patients might describe:

- Bleeding gingival tissue during toothbrushing
- Tender or red swollen gums
- Receeding gingival tissue
- Tooth shifting or elongation (looks longer)
- Mobile (loose) teeth
- Purulent exudate (pus) in-between the teeth and gums
- Abnormal change in the fit of partial dentures
- Halitosis (bad breath)

GINGIVITIS

Gingivitis is an inflammation involving the gingival tissues. Conditions pertaining to the gingiva of principal concern to the Dental Assistant are marginal gingivitis and acute necrotizing ulcerative gingivitis.

Marginal Gingivitis

Marginal gingivitis (fig. 5-7) is the most common type of gingival disease. Most frequently it is the result of poor oral hygiene and affects both the gingival margins and papilla. Chief irritants are food debris and plaque around the necks of the teeth, interproximal spaces, or overhanging margins of dental restorations. Occasionally, a localized inflamed condition may exist from a popcorn husk or toothbrush bristle. Early formation of calculus deposits can also form under the gingival sulcus (subgingival) on the facial and lingual surfaces of the upper and lower teeth. Calculus deposits can also be responsible for the occurrence of marginal gingivitis, and if left untreated, may proceed to destruction of the supporting structures (as in periodontitis).

Marginal gingivitis usually starts at the tips of the papillae and then extends to the gingival margins. Swelling, loss of stippling (orange peel texture of surface) of the attached gingiva, redness, easily retractable sulcus, and foremost, a tendency to bleed easily, are the main characteristics. This condition may be generalized (exist around all teeth), or it may be localized to one or two or a group of teeth.

Acute Necrotizing Ulcerative Gingivitis

Acute necrotizing ulcerative gingivitis (ANUG) (fig. 5-8) is a disease commonly referred to as trenchmouth, or Vincent's infection. It is characterized during the acute stage by redness, swelling, pain, accumulation of calculus around the sulcus of the teeth, and bleeding of the gingival tissues. Usually there is a film of necrotic white or grayish tissue around the teeth. This membrane may be wiped off, leaving a raw, bleeding base. The ulceration of the gingival crest results in a characteristic punched-out appearance and loss of the interdental papillae. There is an unpleasant odor and a foul taste in the mouth. The gingival tissues bleed easily when touched, and patients will complain of not being able to brush their teeth or chew well because of the pain or discomfort.

PERIODONTITIS

Periodontitis (fig. 5-9) is a chronic inflammatory condition that involves the gingiva, crest of the alveolar bone, and periodontal membrane. This condition results in loss of bone that supports the teeth, periodontal pocket formation, and tooth mobility. It usually develops as a result of untreated chronic marginal gingivitis. The color of the gingival tissues is intensified and becomes bluish red as the disease progresses. A gradual recession of the periodontal tissue will occur. Neglected deposits of calculus and formation of additional calculus over time contribute to the spread of the disease. Like marginal gingivitis, it may affect the entire dentition, or only localized areas.

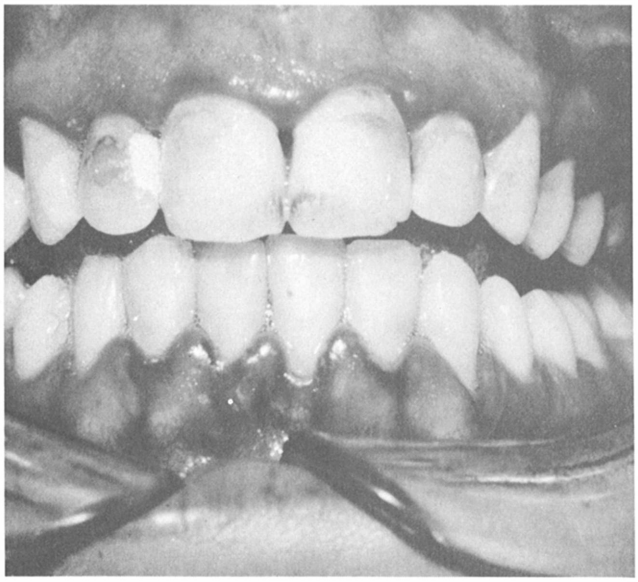

Figure 5-7.—Marginal gingivitis.

Figure 5-8.—Acute necrotizing ulcerative gingivitis (ANUG).

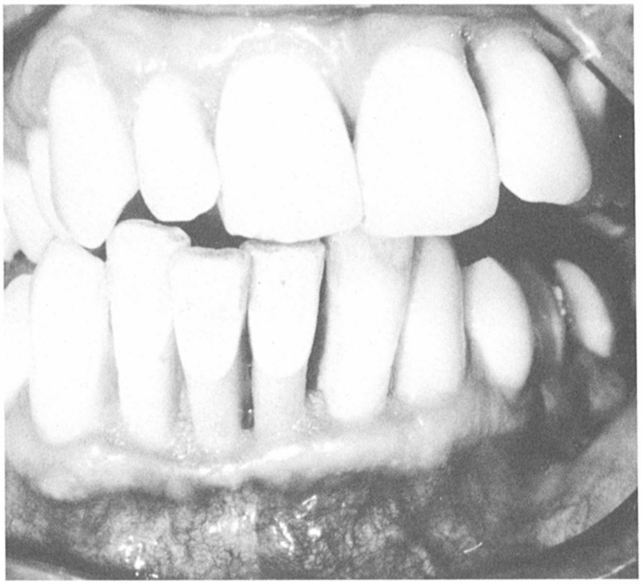

Figure 5-9.—Periodontitis.

Pocket Formation

As the inflammation continues, micro-organisms and their products progress toward the apex of the tooth, forming a *pocket* in which additional calculus forms. Frequently, the gingival margin also recedes toward the apex and the pocket is shallow. With pocket formation, the gingival tissue bleeds easily, and shelflike projections of calculus form between the teeth. These calculus formations irritate the interdental papillae, which become ulcerated and finally are destroyed.

As the rest of the alveolar bone is resorbed, the attachment fibers of the periodontal membrane are loosened. They may remain attached to the tooth for a time, but finally they are destroyed, and the pocket can extend farther toward the apex of the tooth. Eventually, if the condition remains untreated, the tooth will be lost through destruction of its supporting tissues.

Periodontal Abscess

A *periodontal abscess* (fig. 5-10) usually results from long-continued irritation by food debris, plaque, deep deposits of calculus, or foreign objects such as a toothbrush bristle or popcorn husk being tightly packed in the interproximal spaces or within the walls of a pocket. The gingiva surrounding the area becomes inflamed and swollen.

PERICORONITIS

Pericoronitis is an inflammation of the gingiva around a partially erupted tooth. The mandibular third molars are most often affected, although any erupting tooth may be involved. In the mouth of a young adult, part of a tooth can be seen projecting through the gingiva, usually distal to the second molar. The surrounding tissues are usually acutely inflamed. The inflammation may be caused by irritation resulting from the patient's inability to keep the area properly cleansed. Another cause of inflammation is infection from oral pathogens that gained access to the tissues surrounding the crown of the erupting tooth through the opening made by a projecting tooth cusp. The "gingival flap" may become infected after inflammation as a result of the constant irritation caused by contact with the occlusal surface of an erupting maxillary third molar.

DISEASES OF THE ORAL SOFT TISSUES

Many oral diseases can affect the soft tissues. We will cover only a small portion of the most common types. These lesions can be caused by viruses, bacteria, fungi, and physical and chemical agents. Direct contact with the diseases covered may present some degree of hazard or a life-threatening disease to you, the Dental Assistant. Always follow infection control procedures when in contact with all patients.

RECURRENT APHTHOUS STOMATITIS

Recurrent aphthous stomatitis (RAS) *(fig.* 5-11), or canker sores, are painful ulcerations. These lesions

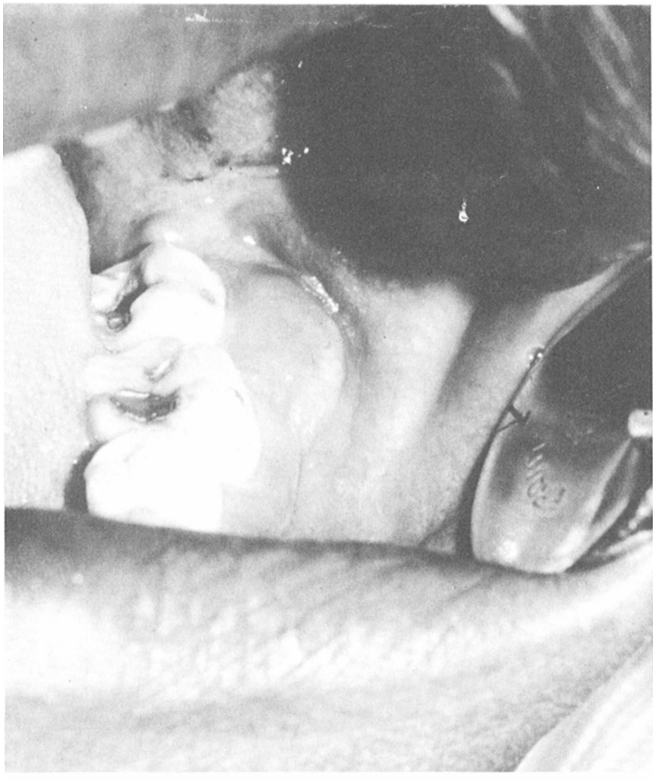

Figure 5-10.—Periodontal abscess.

Figure 5-11.—Recurrent aphthous stomatiti (RAS).

are found in the vestibular and buccal mucosa, tongue, soft palate, and in the floor of the mouth. The exact cause of these lesions are not known, but studies show that physical and emotional stress make them appear. Also injuries from toothbrushing, eating harsh foods, and allergies can start RAS. The healing time of the ulcers is usually 7 to 10 days.

VIRAL INFECTIONS

The viral infections of main concern that will be explained are those caused by the herpes simplex virus (HSV), and the human immunodeficiency virus, also referred to as the HIV (causing AIDS) virus. Both are extremely contagious to you and your other dental patients through cross contamination of dental instruments and dental equipment. Also the virus can gain access via the skin, the eye, or mucous membranes. If you treat a patient with one of these or other viruses, ensure you follow the proper infection control procedures outlined in chapter 10.

Herpes Simplex Viruses

The herpes simplex viruses are among the most common infectious agents. There are two types:

- Herpes simplex virus—Type 1 (HSV-1)
- Herpes simplex virus—Type 2 (HSV-2) (genital herpes)

In oral pathology the most commonly diagnosed sites for HSV-1 are the oral cavity, tongue (fig. 5-12), lips, and the eyes. Direct contact with HSV-1 lesions is probably the most common mode of spread. Transmission through saliva is possible even if there are no active lesions. Infection on the hands of healthcare personnel from patients shedding HSV can result in herpetic lesions.

Other lesions of the HSV-1 virus are acute herpetic gingivostomatitis, characterized by red and swollen gingiva. All of the oral mucosa is tender and eating is painful. Vesicles form throughout the mouth and rupture, leaving painful ulcers.

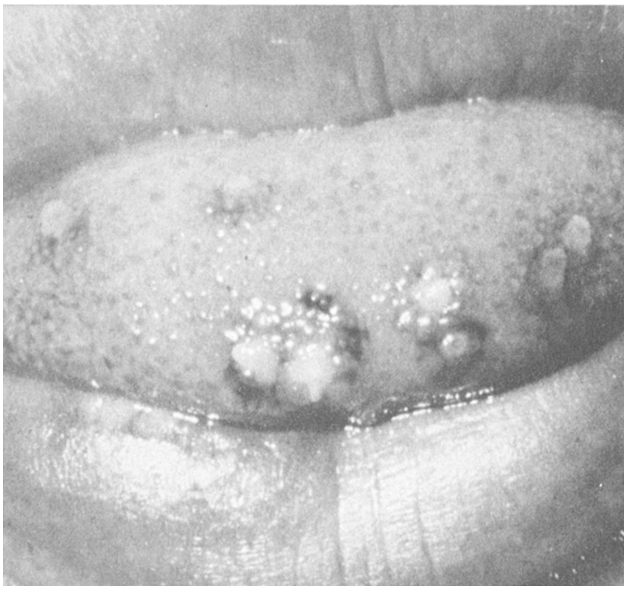

Figure 5-12.—Herpes simplex virus-Type 1 (HSV-1).

The most common of all the herpetic HSV-1 lesions is herpes labialis. They frequently involve the lips and adjacent skin at the corners of the mouth. Recurrence usually starts at the same location, starting with a burning, tingling sensation and then forming vesicles that fuse together leaving large lesions. After the vesicles rupture, crusting of the surface occurs. These lesions are known as "fever blisters." The crusted lesions are also referred to as "cold sores," because a common cold sometimes accompanies these HSV-1 lesions. Known causes for the reoccurrence of the HSV-1 lesions are:

- Sunlight
- Menstruation
- Dental treatment (local trauma)
- Stress or anxiety

The recurrent HSV-1 lesions usually take about 7 to 10 days to resolve. Any routine dental treatment is recommended to be rescheduled during the active phase of these lesions because the disease is highly transmissible.

AIDS Virus (HIV Infection)

The human immunodeficiency virus type 1 (HIV-l) is the main cause of the acquired immunodeficiency syndrome (AIDS). It is a worldwide epidemic. This deadly disease is a direct threat to all dental health professionals and other healthcare workers who are exposed to patients who carry the virus.

Healthcare workers can be exposed to the AIDS virus through contaminated body fluids, exposure to blood or blood products, instruments, and equipment. You should also know some of the oral manifestations that infected people may have. Some of them are the initial signs a dentist can use to diagnosis patients who are carriers of the virus, but who have not been tested or diagnosed. Some of the more common oral manifestations of HIV infection are as follows:

- *Candidiasis*—(fig. 5-13) a fungal infection of the mouth, usually red or white in color
- *Hairy leukoplakia*—(fig. 5-14) a viral infection, whose lesions appear as white, slightly raised, on the tongue
- *Kaposi's sarcoma*—(fig. 5-15) cancerous, dark bluish-purple lesions that involve blood vessels

Procedures and precautions for protection will be discussed in chapter 10, "Infection Control."

ORAL CANCER

Forms of oral cancer are found in the oral cavity at any site, but most often in the tongue, floor of the mouth, and the lower lip. The cancer is a neoplasm

Figure 5-13.—Candidiasis.

Figure 5-14.—Hairy leukoplakia.

(tumor) and is a growth of abnormal tissue. There are two types of neoplasms:

- Benign tumors—not life threatening
- Malignant tumors—life threatening if left untreated

Classifications of Malignant Tumors

Dentists are trained and give special attention when performing an oral cancer screening on a patient to detect any type of cancer. Often these lesions do not cause any pain while in the early stages of development. A malignant tumor can become fatal if not found in its early stages or if left untreated. The following are classifications of malignant tumors.

- *Carcinoma*—cancer of the epithelium usually found on the oral mucosa of the mouth, lips (fig. 5-16), tongue, cheeks, and floor of the mouth. Carcinomas start off looking like elevated or ulcerated lesions, and

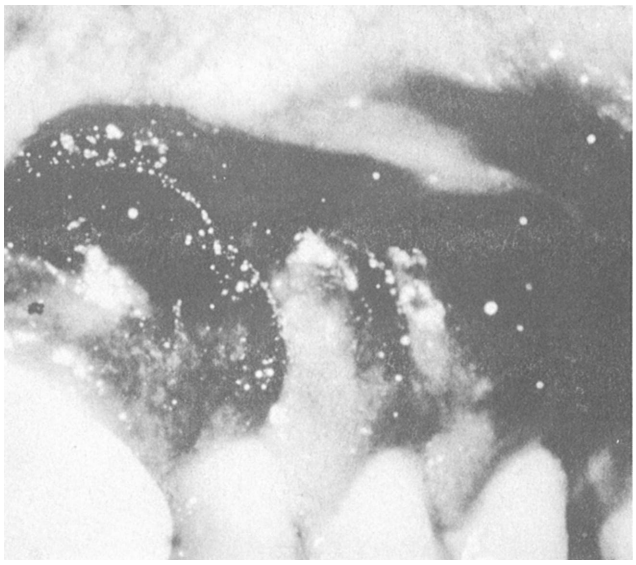

Figure 5-15.—Kaposi's sarcoma.

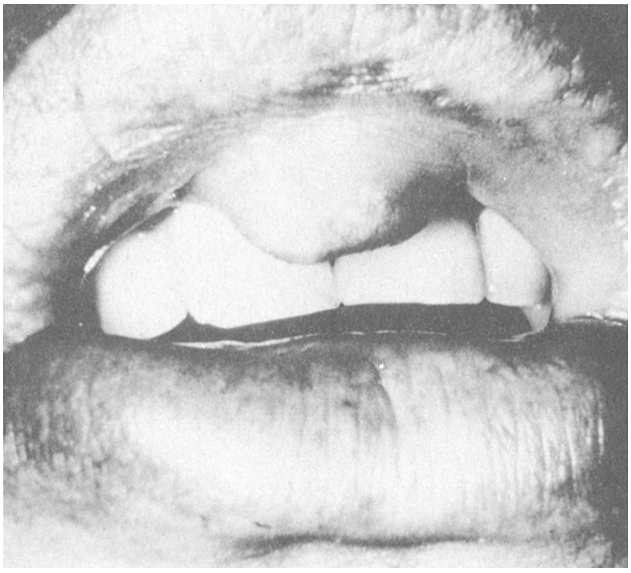

Figure 5-16.—Carcinoma of the upper lip.

can quickly spread to other locations on the body and invade the lymph nodes.

- *Adenocarcinoma* —usually found in the oral region or salivary glands, most often of the palate (fig. 5-17) and appears as a lump or a bulge under the mucosa.

- *Sarcomas*—affects the supportive and connective tissues, for example, bones of the jaw.

Causes

The causes for many neoplasms are unknown. What is known is that the disease is characterized by

Figure 5-17.—Adenocarcinoma.

the abnormal growth and spread of cancer cells. This growth or spread of malignant tumors from one area to another is called *metastasis.* Modern research concerning the development of neoplasms has been linked to the following factors:

- Hereditary
- Chemicals (carcinogens, such as found in tobacco smoke and alcoholic beverages)
- Overexposure to X-rays
- Excessive sunlight

Smokeless Tobacco

Smokeless tobacco, such as chewing tobacco or snuff, may play a role in the development of oral precancerous lesions on the oral mucosa and can result in increased tooth loss from periodontal disease. The area where the user of smokeless tobacco places it in his mouth may leave a smooth or scaly white patch called leukoplakia or snuff-dipper's keratosis (fig. 5-18). Irritation of the oral mucosa occurs because 90 percent of the nicotine of smokeless tobacco is directly absorbed through the oral mucosa, which then goes directly into the blood stream. The effects and damage of nicotine pose a serious health hazard. Many smoking cessation programs are available through naval hospitals and clinics. Dental patients who wish to get assistance from this addiction can be referred to these programs.

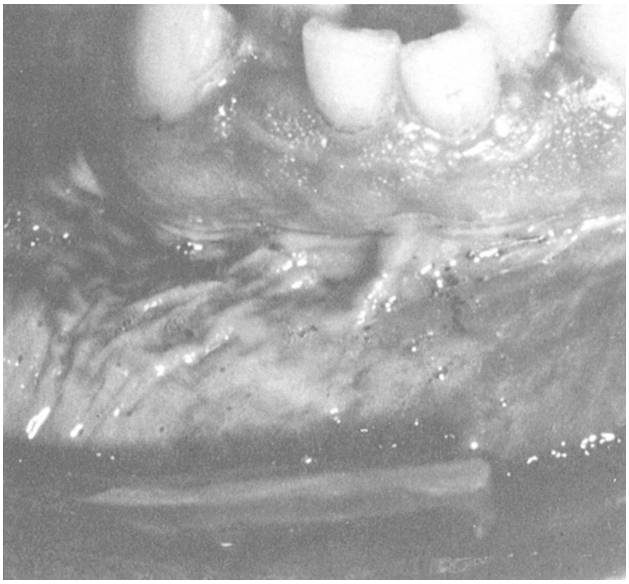

Figure 5-18.—Snuff-dipper's keratosis.